

ELECTROCHEMICAL POWER SOURCE ELECTRODE COATING SYSTEM STATEMENT OF WORK

1. TITLE

1.1. Provide turnkey electrochemical power source electrode coating system for NSWCCD, West Bethesda, Power Systems Branch (644).

2. OBJECTIVE/BACKGROUND

2.1. Provide a turnkey system to produce custom electrodes for materials research in electrochemical power sources. Specifically, provide the capability to produce electrodes from new materials in quantities and qualities allowing numerous cells to be built for evaluation and demonstration. At present, 644 must painstakingly create very small amounts of material providing very few electrodes every one to three months. This allows laboratory scale electrodes, but does not allow scale up to functional components (e.g., battery cells) appropriate for driving portable systems, such as radios, etc.

3. SCOPE OF WORK

The contractor must have a demonstrated familiarity with applied research in novel materials for advanced electrochemical power sources and electrode processing relative to a laboratory environment. Specific and significant experience (more than 5 years) must be demonstrated in the 6.2, or applied research, of lithium-based, rechargeable electrochemical power sources. Special emphasis is given to intercalation compounds and their use in advanced battery electrodes. Contractor reviews will occur at the point of system definition, procurement, installation, and demonstration, with increments of funding occurring for each. The contractor shall provide technical services to 644 as follows:

3.1. **System Definition:** Provide a turnkey electrode coating system.

3.1.1. Provide a **mixer to process electrode slurries** appropriate for the chosen coating materials and equipment(s).

3.1.1.1. The ability to be two-man portable from a wet lab to a dry room, if needed. Laboratory space and equipment versatility being at a premium, a system with submodules that may be used in a stand-alone mode, for each phase of electrode development (synthesis, coating, drying, calendaring, etc.), allowing the use of a minimum of laboratory space for any given stage of electrode production, and the flexibility to be used in various laboratory environments, as they become available, are strongly preferred.

3.1.2. Provide necessary **machinery for a uniform coating** of electrode slurry onto a nurse sheet or current collector within the following specifications:

3.1.2.1. Maximum wet coating thickness of at least 16 mil with reasonable uniformity.

3.1.2.2. Minimum width of 3 inches.

3.1.2.3. Minimum coated area per run equal to 200 square inches.

3.1.2.4. The ability to use a slurry batch of as little as 100ml.

3.1.2.5. The ability to be two-man portable from a wet lab to a dry room, if needed.

3.1.3. Provide **driers** capable of providing minimum coated electrode area within 4 hours, while maintaining electrode integrity and desired properties (e.g., retention of desired morphology).

3.1.3.1. The ability to be two-man portable from a wet lab to a dry room, if needed.

3.1.4. Provide **calendaring** system to compress dried electrode, evenly, under high pressure, and without compromising strength and integrity of the electrode.

3.1.4.1. Additional value will be given to larger diameter calendar rolls.

3.1.4.2. Additional value will be given to heated calendar rolls.

3.1.4.3. The ability to be two-man portable from a wet lab to a dry room, if needed.

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- 3.1.5. **System Definition Review:** The contractor shall present initial details with the proposal.
- 3.1.5.1. **TASK 1A:** Within 15 days of award, a preliminary design review will be conducted at Code 644 (unless otherwise agreed to by both the contractor and 644). This review will serve to allow Code 644 to critique and refine the system design/definition and subcomponents with contractor input and feedback, and within the funds available. \$10K will be paid upon satisfactory completion of this task.
- 3.1.5.2. **TASK 1B:** Within 60 days of award, a final design review will be conducted at Code 644 (unless otherwise agreed to by both the contractor and 644). This review will serve to lock in the system design and define particulars of installation, demonstration, and training, beyond that given in this statement work, and relevant to the specifics of the chosen system. \$100K will be paid upon satisfactory completion of this, facilitating third party equipment purchase.
- 3.1.5.3. Additional value will be attributed to systems, which afford an opportunity for follow-on support, or nearby users of similar system(s).
- 3.1.5.4. Additional value will be attributed to systems, which take up less space and/or are modular and may be stored in a "garage-like" environment.
- 3.1.5.5. Some systems may be downgraded if they require more space than is readily available, or special circumstances (e.g., power upgrades, etc.)
- 3.2. **System Installation** will be done by the contractor with Code 644 supervision, in suitable spaces provided by Code 644, before the end of the third quarter of fiscal year 2004.
- 3.2.1. **TASK 2A:** The contractor shall specify orally and in writing, to Code 644, what the space requirements are, at least 30 days before the arrival of the system at Code 644, including 3.2.1.1 through 3.2.1.6, below. \$5K will be paid upon satisfactory completion of this task.
- 3.2.1.1. Definition of actual space (H x L x W), and restrictions on access (e.g., blocked doorways, inaccessible parts of the system, etc.)
- 3.2.1.2. Environmental needs,
- 3.2.1.3. Power, lighting, and HVAC needs,
- 3.2.1.4. Equipment moving needs, including additional personnel, and length of time required,
- 3.2.1.5. Access to space(s)
- 3.2.1.6. Any special needs not previously noted.
- 3.2.1.7. Additional value will be attributed to contractors who are located near 644 facilities.
- 3.3. **System Demonstration**
- 3.3.1. **TASK 3:** System demonstration will occur on or before 30 JUN 04, and consist of 3.3.2 through 3.3.6, below. \$5K will be paid upon satisfactory completion of this task.
- 3.3.2. Electrode material to be provided by Code 644 as agreed to by Code 644 and the contractor at the completion of design definition.
- 3.3.3. Demonstration the **mixer** through electrode material post-processing as required for the electrode coating apparatus.
- 3.3.4. Demonstration of the **coater** as defined at the completion of design definition and within the parameters given in SYSTEM DEFINITION, above
- 3.3.5. Demonstration of the **dryer(s)**,
- 3.3.5.1. Additional value will be attributed to systems that remove the greatest amount of water, in the shortest time, in the most controllable manner, and allowing the greatest flexibility of placement (facility utilization).
- 3.3.6. Demonstration of **calendaring**, or electrode compaction

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3.3.7. The dimensions and number of electrodes will be agreed to by Code 644 and the contractor at the completion of design definition.

3.4. **TASK 4: System Acceptance** will occur when 3.4.1 through 3.4.2, and their subsections are completed. Upon satisfactory completion, the remainder of awarded funds shall be paid.

3.4.1. Electrodes of agreed material, dimensions, water content, and compaction, are produced having good physical integrity without undue material modification. This will remain a subjective judgment but is readily bounded by manufacturing practice as demonstrated in other lithium battery programs such as the Department of Energy FreedomCar program (others may be substituted).

3.4.2. **Training** of at least one individual, to be designated by Code 644 at the completion of design definition, is provided (not to exceed 5 days, or 40 hours).

3.4.2.1. This training shall include all relevant manuals and **documentation**, to be given into the possession of Code 644.

3.4.2.2. This training may include the packaging of the entire system in preparation for storage, if Code 644 so chooses.

4. GFI

4.1. All applicable technical data including drawings, technical manuals, appropriate and relevant supporting documentation, and sources of scientific information shall be made available by 644 or the West Bethesda technical library.

4.2. Code 644 will provide any and information relevant to system installation (e.g., location(s), size, weight, space limitations, power availability, accessibility, and storage specifications).

4.3. Code 644 will provide all relevant information on the electrode material(s), sizes, and properties, in support of the above requirements.

4.4. Code 644 will provide specifications to adhere to safety regulations.

5. GFE

5.1. Code 644 will provide raw electrode materials, as well as ancillary electrode materials, such as current collectors, nurse sheets, or metal foils, sufficient to install, demonstrate, and train the system.

5.2. Code 644 will provide material and personnel support if necessary, to clean the system and adhere to safety regulations.

5.3. The government shall provide workspace and necessary resources to the contractor if available.

5.4. The contractor may be required to provide computer equipment for contractor personnel.

5.5. The contractor may be required to purchase incidental supplies, not to exceed 2.5% of total contract value.

6. PERFORMANCE AND DELIVERY

6.1. The contractor shall adhere to all points given in the SCOPE OF WORK. The SYSTEM DEMONSTRATION and SYSTEM ACCEPTANCE sections being especially relevant to this topic.

6.2. The contractor shall provide copies of technical information as requested by the project technical lead.

6.3. The contractor will coordinate efforts and exchange information with other contractors and government professionals as required and relevant to tasking specified.

6.4. If a facilitization is required that cannot be accomplished within a reasonable period of time, the contractor and NSWC shall arrange for a minimal installation and acceptance testing required to demonstrate the functionality of the equipment with the limited facilitization permitted.

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6.5. Consideration may have to be given to scheduling of specialized facilities, such as the dry room, to assure that all NSWC needs are being addressed and met in order of importance.

6.6. Consideration may have to be given if NSWC power fails to maintain the required integrity.

6.7. The contractor shall be required to work at the government facility located in West Bethesda, MD or at the contractor's facility as requested by the government representative in charge of the project.

7. CONFERENCES AND MEETINGS

7.1. The contractor shall schedule meetings as defined in the SCOPE OF WORK.

8. TRAVEL

8.1. Local and/or long distance travel may be required to meet objectives. The contractor will alert the technical lead when and where travel is required.

9. SECURITY REQUIREMENTS

9.1. Personnel must be able to work at the NSWC Carderock, West Bethesda site.

10. TECHNICAL POINT OF CONTACT

10.1. Mr. Peter B. Keller (301-227-1833) will be the primary technical point of contact.

10.2. Additional technical points of contact will be Mr. Clint Justin Govar (x5394), Mr. Clinton S. Winchester (x5685), Dr. Patricia H. Smith (x4168), and Ms. Rebecca A. Smith (x4777)

11. SERVICES INFORMATION

11.1. This is not a service. However, in so far as it may apply, the contractor shall not exercise personal judgment on behalf of the Government. The Government shall not assign sub-tasks or prepare work schedules but shall allow the contractor to meet delivery schedules established in the overall task or project. The technical lead shall monitor work via contractor reports as requested.

12. PROPOSAL EVALUATION

12.1. Proposals shall be evaluated on the basis of best value to the government. This will be weighted toward technical value more than best cost. Listed in descending order of importance

12.1.1. *The ability to make electrodes with the following qualities will be given an overall weighting of 30%, roughly broken down as follows:*

12.1.1.1. Ability to produce electrodes of various materials (including metal oxides) over broad range of thickness, having uniform density, good structural integrity, and smooth surface. Bounding dimensions provided in 3.1.2. (8%)

12.1.1.2. Ability to produce electrodes with a minimum of raw material (slurry). (see 3.1.2) (5%)

12.1.1.3. Ability to produce high quality electrodes (as in 12.1.1) in the least amount of time. Significant negative value will be attributed to systems that take more than 8 hours from insertion of the slurry to delivery of a dried, compacted sheet of electrode. (see 3.1.3) (5%)

12.1.1.4. Ability to yield the most water-free electrode (assuming a dry room at less than 3% relative humidity). (see 3.3.5.1) (5%)

12.1.1.5. Ability to provide high and uniform pressure during calendaring of electrodes. (see 3.1.4). (5%)

12.1.1.6. Ability to provide significant heat during calendaring (Heated rollers or platens). (2%).

12.1.2. Technical competence in the realm of materials research and development of electrochemical power systems, and the specific area of electrodes, will be weighted at approximately 20%.

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- 12.1.3. Portability, modularity, storability, and ease of operation, including start-up and clean-up will be weighted at approximately 20%. (several notes throughout section 3)
- 12.1.4. Availability of the contractor during the performance of this procurement and installation. Preference will be given to vendors closer to the Carderock, West Bethesda site, who can be on-site, in person. Importance is based on understanding Code 644 operations, facilities, and equipments, as relates to these equipments, as well as training and general support. (several notes in section 3) (20%)
- 12.1.5. Availability of the vendor after acceptance, in the event of service or modification being required, over the first five years of life will be weighted at approximately 5%. (several notes in section 3)
- 12.1.6. Relevant past performance. (5%)